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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/624,593	07/23/2003	Kei Hayasaki	04329.3100	7500

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EXAMINER	
BARRECA, NICOLE M	
ART UNIT	**PAPER NUMBER**
1756	

DATE MAILED: 05/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/624,593	HAYASAKI ET AL.	
	Examiner	Art Unit	
	Nicole M. Barreca	1756	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 February 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *3-20,23-32,35-40 and 43-133* is/are pending in the application.

4a) Of the above claim(s) *49-131* is/are withdrawn from consideration.

5)☒ Claim(s) *3-20 and 132* is/are allowed.

6)☒ Claim(s) *23-32,35-40 and 43-48* is/are rejected.

7)☒ Claim(s) *133* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *9/27/05*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Claims 3-20, 23-32, 35-40, 43-133 are pending in this application. Claims 49-131 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected inventions, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on 7/13/05.

Information Disclosure Statement

2. The information disclosure statement filed 9/27/05 fails to comply with 37 CFR 1.98(a)(3) because it does not include a concise explanation of the relevance, as it is presently understood by the individual designated in 37 CFR 1.56(c) most knowledgeable about the content of the information, of each patent listed that is not in the English language. It has been placed in the application file, but the information referred to therein has not been considered. The applicant stated that the Japanese Patent Office Action was submitted in lieu of a statement of relevance or full translation of the non-English documents. However this submission fails to comply. The Japanese Patent Office Action refers to claim numbers and cites page and line numbers of the Japanese patents. This however does not provide the examiner with any information with which to determine the relevance of such references, as the applicant failed to include an English translation of the claims submitted to the Japanese Patent Office, or an English translation of the portions of the cited references.

Response to Amendment

3. The previous claim objections and rejections have been withdrawn in response to the applicant's amendments to the claims submitted on 2/28/06.

Claim Objections

4. Applicant is advised that should claim 35 be found allowable, claims 37 and 43 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. Applicant is advised that should claim 36 be found allowable, claim 44 will be objected to under 37 CFR 1.75 as being a substantial duplicate thereof. When two claims in an application are duplicates or else are so close in content that they both cover the same thing, despite a slight difference in wording, it is proper after allowing one claim to object to the other as being a substantial duplicate of the allowed claim. See MPEP § 706.03(k).

Claim Rejections - 35 USC § 112

5. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

6. Claims 35-40, 43-48 and 133 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claims 35, 37, 43 and 45 recite forming a pattern of photosensitive resin film by supplying a developing solution to photosensitive resin film of which the surface layer has been slimmed. However these claims previously recited that the photosensitive resin was reformed (not slimmed) and the examiner has been unable to locate any

support for this amendment in the original specification. The specification discusses slimming the photosensitive resin pattern after developing (Embodiment 1 and 2) and reforming the photosensitive resin after exposure but prior to development and reforming the developed pattern (Embodiment 3). There is no recitation or examples of performing a slimming process prior to development and pattern formation, as recited in the amended claims 35, 37, 43 and 45.

Claim 133 recites the activated water is produced by moving the light along with the water. The examiner has been unable to locate support for this amendment in the original specification. Please reply with the paragraph number(s) if support is present.

7. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

8. Claims 35-40, 43-48, 133 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It is unclear what is meant by "slimming" a surface layer of the photosensitive resin, as recited in claims 35, 37, 43 and 45. The applicant's specification defines a slimming process as the reduction in size of a resist pattern. Applicant additionally argued this definition of slimming with respect other claims. It is therefore unclear how the photosensitive resin can be slimmed prior to the development and formation of a pattern, as recited in claims 35, 37, 43 and 45.

Claim 133 recites the activated water is produced by moving the light along with the water. This is unclear as there is no previous mention of the water being moved.

Claim Rejections - 35 USC § 102

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 23-25, 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Ema (US 6,372,413).

11. A photoresist is formed on substrate 11, exposed through a mask and developed. The substrate was then subjected to a rinsing process in which deionized water containing 3-ppm ozone gas was applied, thereby oxidizing and decomposing resist residues 14A (reforming). See col.3, 9-50. Ozone water is produced by supplying deionized water containing oxygen to a light irradiation unit emitting VUV light of 172 nm. See col.7, 34-45.

12. Applicant's arguments filed 2/28/06 have been fully considered but they are not persuasive. The applicant argues that Ema does not disclose removing a surface layer of the pattern or changing the size of a pattern. However claims 23 and 25 recite that the surface layer is removed by supplying a developing solution. Ema teaches developing the resist, meeting this claim limitation. Claims 23 and 25 do not recite slimming or changing the size of pattern as argued.

Claim Rejections - 35 USC § 103

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

14. Claims 23-25, 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kosa (US 2001/0018168) in view of Ema (US 6,372,413).

15. Resist 11 is applied to the wafer substrate 10, exposed in a pattern and developed. A resist mixture 14 containing dissolved resist 13 and alkaline developer 15 remains. Ozone water 16 is dropped on the resist 11 to wash away the resist mixture 14 (reforming). See [0022]-[0023], [0032]. Kosa does not disclose irradiating the ozone water with light. Ema teaches a method for producing ozone water by supplying deionized water containing oxygen to a light irradiation unit emitting VUV light of 172 nm. See col.7, 34-45. It would have been obvious to one of ordinary skill in the art to produce ozone water in the method of Kosa by supplying deionized water containing oxygen to a light irradiation unit because Ema teaches that this is a known method for producing ozone water.

16. Claims 35-39, 43-45, 47 are rejected under 35 U.S.C. 103(a) as being obvious over Takahashi (US 6, 818,387) in view of Ema.

The applied reference has a common inventor with the instant application. Based upon the earlier effective U.S. filing date of the reference, it constitutes prior art only under 35 U.S.C. 102(e). This rejection under 35 U.S.C. 103(a) might be overcome by: (1) a showing under 37 CFR 1.132 that any invention disclosed but not claimed in

the reference was derived from the inventor of this application and is thus not an invention "by another"; (2) a showing of a date of invention for the claimed subject matter of the application which corresponds to subject matter disclosed but not claimed in the reference, prior to the effective U.S. filing date of the reference under 37 CFR 1.131; or (3) an oath or declaration under 37 CFR 1.130 stating that the application and reference are currently owned by the same party and that the inventor named in the application is the prior inventor under 35 U.S.C. 104, together with a terminal disclaimer in accordance with 37 CFR 1.321(c). This rejection might also be overcome by showing that the reference is disqualified under 35 U.S.C. 103(c) as prior art in a rejection under 35 U.S.C. 103(a). See MPEP § 706.02(l)(1) and § 706.02(l)(2).

17. A resist is coated on substrate 100, exposed through a mask and PEB. An aqueous solution of ozone is applied to the substrate surface, followed by exposure to a developing solution. See col.5, 38-67. Takahashi does not disclose irradiating the ozone water with light. Ema teaches a method for producing ozone water by supplying deionized water containing oxygen to a light irradiation unit emitting VUV light of 172 nm. See col.7, 34-45. It would have been obvious to one of ordinary skill in the art to produce ozone water in the method of Takahashi by supplying deionized water containing oxygen to a light irradiation unit because Ema teaches that this is a known method for producing ozone water.

18. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ema, Kosa in view of Ema.

19. Claims 40 and 48 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi in view of Ema.

20. The references teach using ozone water as the activated water but are silent on the amount of the pattern surface which is removed or oxidized and do not disclose that this is 5 nm or more. However the amount of oxidization would be result effective variables dependent on the specific conditions of the process, such as amount of ozone and time of contact. It would within the ordinary skill of one in the art to determine the optimal pattern surface oxidized in the methods of the cited prior art by routine experimentation and to have this be 5 nm or more, if required, because amount of removal or oxidization is a result-effective variable and the discovery of an optimum value of a result effective variable is ordinary within the skill of the art, as taught by *In re Boesch*, (617 F.2d 272, 205 USPQ 215 (CCPA 1980)).

21. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ema, Kosa in view of Ema or as applied to claim 25 above, and further in view of Yokoi (US 2005/0176259).

22. Claims 38 and 46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Takahashi in view of Ema as applied to claims 37 or45 above, and further in view of Yokoi (US 2005/0176259).

23. The reference dissolve ozone in the activated water with light and do not disclose using hydrogen peroxide. Yokoi teaches dissolving photoresist using either ozone water or an aqueous hydrogen peroxide [0034]-[0035]. It would have been obvious to one of ordinary skill in the art to use hydrogen peroxide instead of ozone for the

activated water because Yokoi teaches that either solution are effective for dissolving photoresist.

24. Claims 29-32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ema, Kosa in view of Ema as applied to claim 25 above, and further in view of Ito (US 2003/0219660).

25. The references do not disclose measuring the pattern dimension by emitting light. Ito teaches a method capable of performing CD slimming with a sufficient tolerance and capable of forming a pattern with a line width of 70 nm or less. Prior to a slimming process, a to be slimmed region of the resist pattern is detected using an optical apparatus with applying light. The energy of a probe was employed as a size-measuring instrument. It would have been obvious to one of ordinary skill in the art to measure the resist pattern by emitting light because Ito teaches that using this method a pattern with a line width of 70 nm or less can be formed and CD slimming with a sufficient tolerance can be achieved. While the reference does not explicitly disclose repeating the measurement and reforming process, it would have been obvious to one of ordinary skill in the art that the process would be repeated until the desired resist pattern was achieved. [0008]-[0011], [0030]-[0041], [0088].

Allowable Subject Matter

26. Claims 3-20, 132 are allowed.

27. Claim 133 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, 1st and 2nd paragraph, set forth in this Office action.

28. The following is a statement of reasons for the indication of allowable subject matter: the prior art fails to teach or suggest a pattern forming method including the combination of the process steps as claimed including slimming to remove a surface layer of a resist pattern by contacting the pattern with activated water wherein the activated water contains radical of atoms or molecules produced by irradiating the water with light or wherein the activated water contained radical produced by irradiating the water in which molecules of gas are dissolved with light.

Response to Arguments

29. Applicant's arguments with respect to claims 23 and 25 over Ema have been addressed. Applicant's other arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

30. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

31. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Nicole M. Barreca whose telephone number is 571-272-1379. The examiner can normally be reached on Monday-Thursday (9AM-7PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark F. Huff can be reached on 571-272-1385. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Nicole M Barreca
Primary Examiner
Art Unit 1756

5/14/06